A Federated Health Care System: Linking Empirical and Patient Information Systems

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Health care professionals face a growing variety of information systems relevant to their activities and goals. This variety imposes on them not only the burden of studying a multitude of access methods and system boundaries but also the burden of manually integrating information accessed from different systems. Federated heterogenous database systems which integrate multiple, independent, information systems offer a solution to this problem. This paper is on such an integration of two autonomous and independently designed systems for health care. The first component is MacPatient which tracks patient information. The second called Empiricist is a text retrieval system concentrating on the empirical literature. Both systems share a common domain: intravascular (IV) therapy and are designed to serve overlapping populations of health care providers.

This research: (1) offers the logical design for a federated heterogeneous system for health care, consisting of a text retrieval system and a patient information system; (2) demonstrates a formal procedure for designing similar federated applications and (3) addresses a specific lack in current database research, i.e. issues to consider when text retrieval systems participate in heterogeneous systems.

MacPatient: MacPatient is a combined data acquisition and alerting system used within the clinical practice environment by nurse clinicians to maintain patient IV therapy data. It was developed using Aldus Supercard on a Macintosh platform. Currently the prototype contains clinical data on approximately seventy-five patients.

MacPatient maintains for each patient general information and information on each active site. This information is analyzed automatically by the system to build a specific set of alert messages for the nurse. Alerts are designed to help prevent the onset of intravenous therapy complications, particularly phlebitis. The goal is to provide the practicing nurse with up-to-date research based alerts to guide decision making while managing patients receiving IV therapy. Alerts are automatically generated when a nurse has completed data entry/editing of a patient's record.

Empiricist: Empiricist is an experimental text retrieval system designed to access texts describing empirical investigations. The prototype version provides access to a collection of 65 abstracts presenting experiments in IV therapy. Empiricist is implemented using Hypercard 2.1 on a Macintosh platform.

Empiricist differs from other text retrieval systems in that it employs a structured representation (using complex objects) instead of the more common, structure independent keyword representation. In the complex object representations keywords are tied to particular text based roles. Therefore an abstract may be represented by 'aspirin' in the role of a treatment substance and 'proteinuria' as a dependent variable. The complex object's structure is patterned to reflect the typical information components contained in empirical abstracts. Empiricist allows the user a powerful retrieval strategy, i.e. the capacity to specify the query in terms of a desired experiment. For example, a query where 'aspirin-dipyridamole' is a treatment substance and 'diabetes' is a central patient characteristic is allowed.

The integration approach adopted here would allow the user of the federated system to submit a global query to both component systems. Alternatively a query may originate at one system and be directed to the other component system.

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